

A PLAN FOR COORDINATED ALL-BIRD MONITORING IN MONTANA



Version 4.0
October 2006

Prepared for the Montana CBM Steering Committee by:

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Online version: http://avianscience.dbs.umt.edu/research_coordinated.htm

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EXECUTIVE SUMMARY

At the request of the Montana Bird Conservation Partnership, the Avian Science Center has taken the lead in developing the initial drafts of this Coordinated Bird Monitoring (CBM) plan, based on our involvement with the Landbird Monitoring Program, additional monitoring efforts, and the Western Working Group of Partners in Flight. The ultimate success of the plan, however, will depend on the active participation and ownership of all interested partners at every stage of the planning process. In Montana, there exists a strong interest in collaboration within State and Federal agencies and amongst the academic and conservation communities. This draft Plan should now be reviewed and revised by all of these interested partners. Their ideas and comments should be integrated with recommendations generated from Montana's Comprehensive Fish and Wildlife Conservation Strategy written by MTFWP. To implement a Coordinated Bird Monitoring plan in Montana, we propose a division-of-labor approach that shares the burden of implementation among the program partners. An important step is deciding which of the participating organizations will take responsibility for each component of the plan. Implementation of this plan will likely best be realized with the addition of a paid all-bird coordinator for Montana.

The overarching goals for the proposed Coordinated Bird Monitoring (CBM) program are to document population trends of bird species and to understand effects of land management activities. Coordinated all-bird monitoring is intended as a feedback system that provides a scientific basis for adaptive management and conservation planning. Montana's CBM Plan is designed to be part of a national CBM effort that is currently being developed by managers and scientists (see <http://amap.wr.usgs.gov>) to improve the success of bird monitoring programs and make the information widely available to all partners and decision-makers.

Most land management agencies allow a variety of activities to be conducted on their lands, but these activities occur within the overriding legal constraint that species, ecosystems, and processes be maintained on the landscape. Unfortunately, most land management agencies have not yet achieved the level or kind of monitoring needed to be able to assess the ecological effects of their land use practices.

Birds have often been proposed as meaningful indicators of ecosystem health. The bird community in a landscape reflects an integration of a broad array of ecosystem conditions. The cumulative effects of alterations to these ecosystem conditions are difficult to predict in any other way than through integrators such as birds. Given this broad context for monitoring, birds can then be appreciated as a cost-effective monitoring tool for gathering information on the overall health of many ecosystems in Montana. Moreover, no other vertebrate group is as visible or as cost effective to monitor; no other can have as large a proportion of its members simultaneously surveyed using simple techniques; and no other holds as much public appeal.

Monitoring data generated through a region-wide, comprehensive, credible process will increase support for funding and protection initiatives, encourage participation by cooperators, allow for prioritization of conservation activities, and ultimately improve conservation of bird populations. A coordinated bird monitoring program also helps agencies meet the intent of the January 10, 2001, Presidential Executive Order 13186 regarding new responsibilities that federal agencies now have to cooperate in the protection of migratory birds and their habitats.

Good management decisions require the best information attainable. Information comes from a variety of sources, many of which are not always readily available. Coordination can provide the necessary network for all partners to learn what information is available, how it can be used to inform management, and what new data needs to be collected. All of our efforts to collect new

information are strengthened if there is coordination and standardization at the planning, implementation, and knowledge-sharing stages. The network also needs to be able to respond to new information needs in a way that best facilitates adaptive management.

The integration of existing monitoring efforts is one of the main motivating factors for developing Coordinated Bird Monitoring. The integration of ongoing work into widely accessible databases will allow management agencies to determine whether similar work has already been done; where resources can be most effectively allocated to obtain information that is still lacking; which protocols are recommended for all projects; and how information from local efforts can be put to broader use than that intended by the scope of a smaller, local project. Pooling of data from a variety of projects will provide a more powerful overall view of bird conservation effectiveness.

There have been several recent calls for bird monitoring programs to become more focused on management applicability. The Montana Bird Conservation Partnership is in full agreement that a management focus is essential, but there is also a consensus on the desirability of continuing the long-term monitoring of bird population trends throughout the State.

Therefore, we recommend that the Montana CBM program adopt a design that includes elements of both random survey sites and targeted sites under habitat management. Random sites are necessary because the targeted sites cannot by themselves produce overall population trends. Adding targeted sites will ensure that useful management information can be explicitly guaranteed from the overall monitoring program. The specific management issues to address will be chosen through ongoing discussions with habitat managers and wildlife biologists throughout Montana.

An essential aspect of any monitoring program is the ability to get results into the hands of participating partners and managers as quickly as possible, and in an understandable and usable form. Too many monitoring data collection efforts over the years have produced notebooks full of data that may or may not be still sitting on somebody's shelf. One of the more exciting aspects of this plan will involve the directed pursuit of information relevant to managers and the continuing development of innovative ways to synthesize and disseminate these results, through reports, published papers, workshops, and a web interface. We look forward to all partners working together to help make these goals a reality.

The specific objectives are, therefore:

- 1) to integrate existing bird monitoring efforts in Montana;
- 2) to provide long-term trend data to identify species of concern and management issues needing further study;
- 3) to provide habitat relationship data and results for most bird species;
- 4) to test the effectiveness of specific management activities by incorporating targeted habitat surveys into the monitoring design;
- 5) to enable the development of decision support tools "decision support tools" for managers using regional habitat models based on the long-term survey data;
- 6) to maintain a high-quality data archive and facilitate the easy access to all results (and most data) by all partners.

INTRODUCTION

The Development of Montana's Coordinated Bird Monitoring Plan

Coordinated all-bird monitoring is intended as a feedback system that can provide a scientific basis for adaptive management and conservation planning. Montana's Coordinated Bird Monitoring (CBM) Plan is designed to be part of a national CBM effort that is currently being developed by managers and scientists (see <http://amap.wr.usgs.gov>) to improve the success of bird monitoring programs and make the information widely available to all partners and other decision-makers. At this time, CBM plans are being developed at state, regional, and continental scales. One such regional plan is the Intermountain West Coordinated Bird Monitoring Program: <http://greatbasin.nbii.gov/iwcbm/>

Each plan describes existing monitoring programs and then identifies needed improvements and new programs using the following approach: 1) identify the overarching goals of the program and the specific objectives that underlie these goals; 2) determine strategies and study design necessary to achieve these goals; 3) secure commitments (financial and otherwise) from interested partners; and 4) implement the program.

Several projects are already in progress at the continental level that will help implement monitoring recommendations at the state, province, or regional level. For example, a system for conducting peer reviews of survey protocols is currently being developed, data repositories are being constructed, and rapid habitat survey methods are being designed. The Montana plan is designed to use these resources and to support the continental programs, where appropriate.

At the request of the Montana Bird Conservation Partnership, the Avian Science Center has taken the lead in developing the initial drafts of this CBM plan, based on our involvement with the Landbird Monitoring Program, other monitoring efforts, and the Western Working Group of Partners in Flight. The ultimate success of the plan, however, will depend on the active participation and ownership of all interested partners at every stage of the planning process. In Montana, there exists a strong interest in collaboration within State and Federal agencies and amongst the academic and conservation communities. This draft Plan should now be reviewed and revised by all of these interested partners. All of their ideas and comments should be integrated with recommendations generated from Montana's [Comprehensive Fish and Wildlife Conservation Strategy](#) being written by MTFWP. The partners will then seek buy-in from all relevant agencies and organizations and commence implementation as soon as it becomes feasible.

Why Monitor Birds?

The most compelling reason for monitoring wildlife, including birds, is to determine whether human societies are living in a sustainable manner (Greenwood et al. 1993, Hutto and Young 2002). Most land management agencies allow a variety of activities to be conducted on their lands, but these activities occur within the overriding legal constraint that species, ecosystems, and processes be maintained on the landscape. In fact, the National Forest Management Act, National Environmental Policy Act, Fish and Wildlife Conservation Act, Migratory Bird Treaty Act, Endangered Species Act, and various state laws require that the public land management agencies not operate in a way that threatens the viability of native wildlife populations.

Many bird species are declining, or suspected to be declining, in Montana and throughout the Intermountain West (Sauer et al. 1997). Unless declines are halted, some species will eventually need increased expenditure for protection and management, or even listing under the Endangered Species Act (ESA), a measure that is generally considered a last resort in species protection.

Nearly all natural resource managers therefore recognize the need for a monitoring program designed to serve as an “early-warning” system that identifies declining species and causes of declines in a proactive manner before management and conservation options become limited.

Unfortunately, most land management agencies have not yet achieved the level or kind of monitoring needed to be able to assess the ecological effects of their land use practices. Even conservation organizations have been criticized recently (Christensen 2003) for not assessing the effects of their own conservation and restoration actions through some sort of monitoring activity. For both agencies and conservation organizations “...it is far easier to measure what you do and call it success than it is to take a hard look at whether you actually made a difference” (Christensen 2003).

The best way to determine if the integrity of ecosystems is threatened is by monitoring some indicator of ecological integrity. Birds have often been proposed as meaningful indicators of ecosystem health (e.g., Morrison 1986, Croonquist and Brooks 1991). The bird community in a landscape reflects an integration of a broad array of ecosystem conditions, including water quality, productivity, vegetation structure and composition, and landscape integrity (U.S. EPA. 2002). The cumulative effects of alterations to these ecosystem conditions are difficult to predict in any other way than through integrators such as birds (Harris 1988). Given this broad context for monitoring, birds can then be appreciated as an effective monitoring tool to determine if we are living sustainably, and if not, how we might operate in a more sustainable fashion (Hutto and Young 2002). Moreover, no other vertebrate group is as visible or as cost effective to monitor; no other can have as large a proportion of its members simultaneously surveyed using simple techniques; and no other holds as much public appeal (Hutto 1998, 2004; Mac Nally et al. 2004). Monitoring a diverse assemblage of species with differing habitat requirements such as birds is a relatively cost-effective means for gathering information on the overall health of many ecosystems in Montana.

The Need for a Coordinated All-Bird Monitoring Program

In light of the social, political, and economic factors that influence funding of conservation efforts, it is essential that programs are cost-effective, provide the highest-quality data, and receive long-term commitments (Carlson and Schmiegelow 2002). Monitoring data generated through a region-wide, comprehensive, credible process will increase support for funding and protection initiatives, encourage participation by cooperators, allow for prioritization of conservation activities, and ultimately improve conservation of bird populations. A coordinated bird monitoring program also helps agencies meet the intent of the January 10, 2001, Presidential Executive Order 13186 regarding new responsibilities that federal agencies now have to cooperate in the protection of migratory birds and their habitats (see <http://ceq.eh.doe.gov/nepa/regs/eos/eo13186.html>).

Specifically, this CBM program will provide:

An Information network for adaptive management – Good management decisions require the best information attainable. Information comes from a variety of sources, and these sources are not always readily available. Coordination can provide the necessary network for all partners to learn what information is available, how it can be used to inform management, and what new information needs to be collected. All of our efforts to collect new information are strengthened if there is coordination and standardization at the planning, implementation, and information-sharing stages. The network also needs to be able to respond to new information needs in a way that best facilitates adaptive management.

The Integration of existing bird monitoring efforts - In Montana, many groups and agencies monitor various bird species. The integration of existing monitoring efforts is one of the main motivating factors for developing Coordinated Bird Monitoring efforts at the state, regional, and continental scales. The integration of ongoing work into widely accessible databases will allow:

- Management agencies to determine whether similar work has already been done;
- Resources to be more effectively allocated to obtain information that is still lacking;
- Information from local efforts to be put to broader use than that intended by the scope of a smaller, local project;
- Pooling of data from a variety of projects to provide a more powerful overall view of bird conservation effectiveness.

The ability to implement recommended protocols – Monitoring programs are continually being initiated, critiqued and revised, allowing experts to determine the most accurate and efficient methods for monitoring a variety of bird species. National working groups collect this information and make recommendations for standard protocols to be followed in monitoring different species groups (e.g. songbirds, raptors, shorebirds, etc.). A CBM program allows access to this information for everyone wishing to monitor birds, and encourages full cooperation with surrounding jurisdictions in order to implement appropriate and consistent protocols.

Electronic data storage and information sharing – A useful information network requires access to all information by all partners. Data from inventory and monitoring surveys in Montana are stored at the Natural Heritage Program, the Avian Science Center, the US Forest Service Fauna Database, and various shelves and personal computers around the state. It is not necessary that all data be stored in the same place, but it is important that someone needing information can go to one source and find out what is available and where it can be found. We are working with the Avian Knowledge Network (<http://www.avianknowledge.net/>) at the [Cornell Lab of Ornithology](#) to achieve this goal.

Goals and Objectives for the Montana CBM Program:

The overarching goals for the proposed coordinated bird monitoring program are to document population trends and to understand effects of land management activities.

The specific objectives are, therefore:

- 1) to integrate existing bird monitoring efforts in Montana;
- 2) to provide long-term trend data to identify species of concern and management issues needing further study;
- 3) to provide habitat relationship data and results for most bird species;
- 4) to test the effectiveness of specific management activities by incorporating targeted habitat surveys into the monitoring design;
- 5) to enable the development of decision support tools "decision support tools" for managers using regional habitat models based on the long-term survey data;
- 6) to maintain a high-quality data archive and facilitate the easy access to all results (and most data) by all partners.

SUMMARY OF EXISTING BIRD MONITORING PROJECTS IN MONTANA

In order to clarify the needs associated with a coordinated statewide monitoring program, it is important to compile, involve and assess existing bird monitoring efforts in Montana that have the potential to provide quality long-term monitoring data and further illuminate bird habitat relationships and distributions. Many of these projects should continue as they are and some should be encouraged to expand. Others may have been inconsistent over time and need to be reviewed for possible renewal and support with new expertise and funds. All need to be coordinated so that the entire bird-monitoring community may access the data (where appropriate) or results.

The following information has been garnered from the database of MTFWP (Steve Carson) and inquiries initiated by the Avian Science Center primarily during the winter of 2005. It may be necessary to update this list and gather more information on monitoring surveys and the potential they hold for continuation, collaboration, and data sharing.

Landbird Monitoring Program (LBMP)

Primary Contacts: Jock Young, Amy Cilimburg – ASC

URL: http://www.avianscience.org/research_landbird.htm

The Landbird Monitoring Program has run point counts in Montana (and Northern Idaho) since 1994. This began as a program of the US Forest Service Northern Region, with Potlatch Timber Company as an initial partner and what is now the Avian Science Center at the University of Montana as the coordinator. The LBMP now consists of Region 1 of the Forest Service and Potlatch Timber Co., together with other partners in Montana who participate as funds and interests allow: the Bureau of Land Management (BLM), the Confederated Salish and Kootenai Tribes (CSKT), Glacier National Park (GNP), and Montana Fish, Wildlife and Parks (MTFWP).

The LBMP survey design for data collected 1994-2004 consists of geographically stratified transects with randomly located start points, each visited once during any given survey year. Each transect generally involves 10 point counts, each 10 minutes long. The LBMP benefits from carefully screened, paid technicians, a week-long training session, and in-field follow-up.

As of 2004, the LBMP was surveying 443 active transects in Montana that could be continued into the future (see map below); about 250 of these have been surveyed consistently since 1994 or 1995. There were 278 transects on USFS lands (in Montana), 58 transects on BLM (and private) lands in SW and SE Montana, 26 transects on CSKT lands (begun in 1996), 26 transects in Glacier National Park (begun in 2004), and 55 new random transects placed throughout north-central and northeastern Montana, supported by State Wildlife Grant funds in 2003 and 2004.

It has always been the dual focus of the Landbird Monitoring Program to produce interim results on habitat relationships and management effects as well as to collect long-term population trend data. The incorporation of management-effects studies on an alternate-year basis was initiated by the LBMP in 1996 (studies have included forest thinning, dry forest restoration, and high-elevation willow riparian grazing effects).

LBMP Transects - 2004



The LBMP has also responded to requests from the USFS Region 1 to study presence/absence and habitat associations of individual species. In 2005, a monitoring protocol was developed and tested for Flammulated Owls, and Northern Goshawks were surveyed (see below). Additional Black-backed Woodpecker surveys were conducted in 2006. Depending on the needs of the agencies, the LBMP and ASC may periodically continue these or other single species survey efforts.

In 2006 the LBMP also began exploring a new grid-based survey design. See the Section on Long-term Monitoring and the LBMP (page xxx) for details.

LBMP Riparian-specific surveys:

Primary Contacts: Anna Noson, Rob Fletcher – ASC

URL: http://avianscience.dbs.umt.edu/research_riparian.htm

In 2002, the LBMP began developing a targeted survey program for deciduous riparian habitats. Intensive bird surveys have occurred every year since inception along > 500 mi Madison/Missouri River Complex. These surveys have been funded by PPL MT and the BLM. Sampling protocols were developed and tested, and bird data is being used to develop habitat relationship models that will identify critical areas of habitat along these rivers and predict changes in focal species populations with changes in habitat availability and structure. To expand this program statewide, the ASC (through funding from the State Wildlife Grants) and the American Bird Conservancy assessed the availability of deciduous riparian forest habitat along all major rivers (4th order or larger streams) in the State. Potential sites were ground-truthed in 2004. Surveying random sites within reaches of 5 major watersheds began in western Montana 2005 in cooperation with MTFWP. Only a small amount of funding was obtained from MTFWP in 2006 to resurvey restoration areas in the Big Hole Watershed. See section 1b, page 20 for more details.

For all the LBMP data, the Avian Science Center maintains the database (available on the ASC web site) and is in the process of upgrading to a web-available SQL database structure.

Breeding Bird Survey

Primary Contact: Dan Sullivan (MT); Keith Pardiek (National)

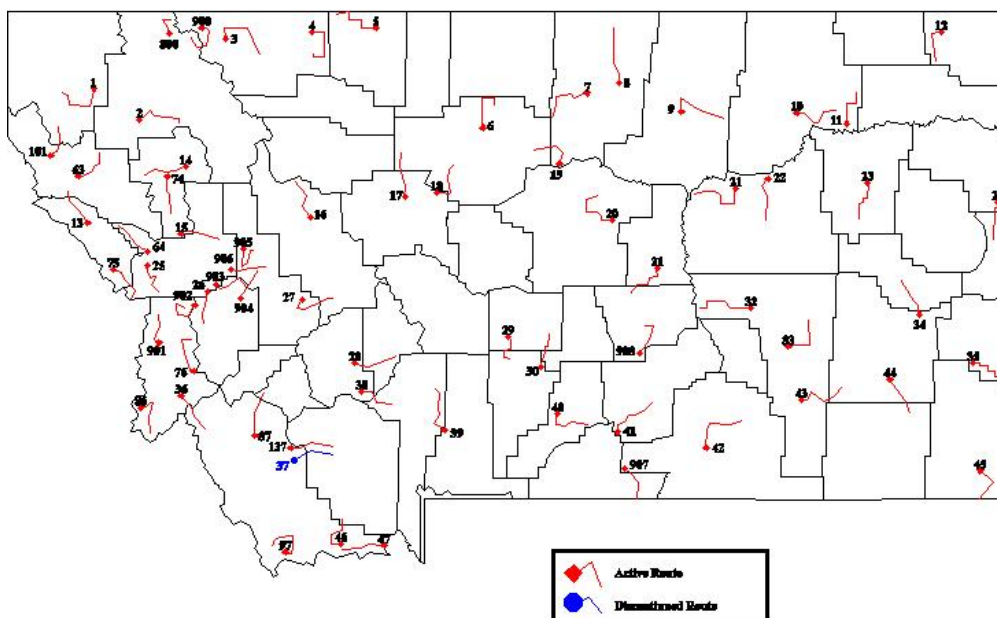
URL: <http://www.pwrc.usgs.gov/bbs/>

The Breeding Bird Survey (BBS), a roadside survey designed to monitor population trends of land birds, was initiated in 1966 by the [Patuxent Wildlife Research Center](#), which at present is part of the U.S. Geological Survey, Biological Resources Division. It is the only large-scale monitoring effort with that length of operation, and most analyses and discussions of bird population declines are based on these data. Trend estimates for more than 420 bird species and all raw data are currently available via the BBS web site.

Each survey route is 24.5 miles long with 50 stops spaced at 0.5-mile intervals. At each stop, a 3-minute point count is conducted. During the count, every bird seen within a 0.25-mile radius or heard is recorded. Surveys start one-half hour before local sunrise and take about 5 hours to complete. Over 4100 survey routes are located across the continental U.S. and Canada. In Montana, the BBS began in 1968 with 11 routes and now consists of 56 official and 9 non-random routes throughout the state.

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BREEDING BIRD SURVEY ROUTE LOCATIONS



NOTE: Survey routes are not drawn to scale and are intended only to provide approximate route locations (4/94, klp).

Natural Heritage Program Grassland Bird Count

Primary Contact: John Carlson – BLM, Paul Hendricks – MNHP

These point counts were established on grasslands in northern Valley County (primarily BLM lands) to access grazing treatments. These are randomly selected (stratified by soil layer to identify grassland type) off-road transects consisting of 3 points each. Project duration to date is 2001-2005, and it is unclear if they will continue. MNHP maintains the Access database.

MTFWP Raptor Surveys

Primary contact: Ryan Rauscher, MTFWP
<http://fwp.mt.gov/wildthings/default.html>

URL: <http://fwp.state.mt.us>

Montana State Fish, Wildlife, and Parks coordinates 46 long-term Raptor Survey Routes across the state. These were initiated in 1979 to monitor long-term population trends for resident breeding raptor species. The basic design is similar to the BBS. Forty-six driving routes are surveyed each year between May 15 and June 5, many of which are routes run by citizen volunteers. An extensive data analysis is currently being done on the 26 years of data collected to date and results of this analysis should be posted on the MTFWP web page. Presently, volunteer coordination is done by MTFWP; they are seeking funds to cover coordination of field efforts and compilation and analysis of data collected.

MTFWP Bald Eagle Surveys

Primary Contact: Kristi DuBois – MTFWP

URL: <http://fwp.mt.gov/wildthings/tande/baldeagle.html>

Approximately 200-220 of the over 300 known Bald Eagle nests in Montana are monitored yearly as required by the Endangered Species Act. This is a collaborative effort organized by Kristi DuBois of MTFWP, and she maintains the database (SQL). These surveys will continue in some format once Bald Eagles are officially delisted and a monitoring plan is in place (required for at least 5 years post delisting). There is also an ongoing small mid-winter Bald Eagle survey (4 routes) that is part of national effort to obtain resident population estimations. Rob Hazlewood (FWS) presently holds the Montana data, although the project was recently transferred to Sarah LaMarr of the BLM.

USFS Goshawk Surveys

Primary Contact: Skip Kowalski, USFS

Protocols: http://www.fs.fed.us/biology/wildecology/goshawk_monitoring.html

The Forest Service has periodically searched for and monitored the nests of Northern Goshawks on USFS lands. A Region-wide effort in collaboration with the Avian Science Center occurred in 2005 to locate goshawks using the [standardized USFS protocol](#) and may be resumed in future years as a more consistent monitoring program. Individual National Forests may continue such work in 2006 and beyond (e.g., Helena NF). Data from individual Forests need to be combined (and data sharing worked out with the USFS Fauna database).

Raptor View Research Institute

Primary contact: Rob Domenech

URL: <http://www.raptorview.org>

This non-profit research and education organization runs fall migration raptor point counts and bands raptors on Rogers Pass, MT. Counts began in 2002, with an emphasis on Golden Eagles. RVRI plans to increase their exploratory effort to locate viable spring and fall migration point count and banding sites in west-central Montana in order to gather information on raptor movements and migratory ecology. During the spring of 2005, they initiated a Swainson's Hawk nesting and productivity study in the valleys around Missoula.

Hawk Watch International

Primary Contact: Jeff Smith URL: <http://www.hawkwatch.org/migration/migration.php>

[HawkWatch International \(HWI\)](#) runs the Bridger Mountains Raptor Migration Project in southwestern MT on the Gallatin National Forest. HWI began fall migration counts at this site in 1991, with standardized, single-site counts commencing in 1992. This ongoing effort monitors long-term trends in populations of raptors using this northern portion of the Rocky Mountain Flyway. The count now occurs on the ridge above Bridger Bowl Ski Area, ~ 25 miles northeast of Bozeman. The flyway is noted for the largest concentration of Golden Eagles in the lower 48 states, with peak eagle activity in mid-October. Seventeen additional species also may be seen each season, with Sharp-shinned Hawks, Cooper's Hawks, Red-tailed Hawks, Bald Eagles, and American Kestrels among the most commonly seen species. The project runs from 27 August to 31 October each year. HWI maintains the database: 1999 – 2003 data from all their sites are presently available from their website.

HWI has also run a Rogers Pass spring raptor migration study, an effort to monitor long-term trends in populations of raptors, primarily Golden Eagles, using this northern portion of the Rocky Mountain Flyway. Fred and Cathy Tilly have conducted annual counts during March and have recorded 14 species of migratory raptors at the site, with Golden and Bald Eagles typically comprise 93-96% of the count. This survey has not been completed since 2002, and its future is uncertain.

Owl Research Institute

Primary Contact: Denver Holt

URL: <http://www.owlinstitute.org/research.html>

The Owl Research Institute monitors Long-eared Owls yearly, with repeated visit to known roosting and breeding sites throughout western Montana, but especially in the areas around the Mission and Missoula Valleys. Begun in the winter of 1986, the Long-eared Owl project is an ongoing effort to document their complete life history in western Montana. Almost 1,000 Long-eared Owls have been banded, and recapturing provides data on such topics as communal roosting, migration and mating habits. ORI also inventories numerous owl species throughout west-central Montana.

Flammulated Owl Surveys

Primary Contact: Amy Cilimburg, Avian Science Center, or USFS Region One

URL: http://avianscience.dbs.umn.edu/research_landbird_flam.htm

In 2005 the Forest Service and the Avian Science Center initiated the first ever region-wide effort to understand Flammulated Owl distribution. These data are now available at the web address above. A monitoring protocol has been developed. Though the USFS does not plan a region-wide continuation of this program at this time, they may continue the 2005 surveys at another time, and individual forests are encouraged to continue monitoring.

Common Loon Surveys

Primary Contact: Gael Bissell (MTFWP), co-coordinator with Jane Ingebretson (USFS)

These are annual breeding loon surveys run by volunteers (agency individuals and the general public) to determine trends in abundance and nest success. Formal surveys began in 1993 (incidental data prior to this). In May all lakes known or suspected to have breeding Common Loons are checked for presence / absence (180 lakes, approximately 50 in Glacier National Park). The third week of July a full count is undertaken (adults and young). Data are entered on web and stored in a SQL database ([FWPwild](#)) with a shape file of lake territories in a separate database (housed with Natural Heritage Program).

Waterfowl Breeding Population Survey

Primary Contact: Jim Hansen - MTFWP, Jim Volzer – USFWS?

URL: http://centralflyway.org/Surveys_and_Estimates.html#largescale

Each May and June, the Canadian Wildlife Service and the USFWS survey breeding waterfowl from the north-central U.S. through Canada and Alaska. Survey biologists estimate numbers and species from airplanes flown along transects. A portion of the transects are then surveyed from the ground by biologists who census all waterfowl. The ground census corrects for birds not counted by the aerial team. This survey is the most extensive wildlife survey in the world, and its results are a major factor used in setting annual duck-hunting regulations. Excellent survey data exist in the form of graphs for mallards, gadwall, American wigeon, green-winged teal, blue-winged teal, northern shoveler, northern pintail, redhead, canvasback, and scaup.

Procedures followed in conducting this survey are described in the Standard Operating Procedures for Aerial Breeding Ground Surveys in North America, Section III, revised 1987, 2003 revision pending. The survey design for Montana included 11 air/ground comparison segments comprising 5.7% of the total 193 segments flown. The 2006 report can be found [here](#).

In Montana, aerial surveys are completed for the northeast 2/3 of the state (BCR 11 and, less intensely, BCR 17). For the Waterfowl Breeding Population & Habitat Survey, raw bird data and GIS information can be retrieved from <http://mbirdims.fws.gov/nbii/>.

Mid-Winter Waterfowl Survey

Primary Contact: Jim Hansen URL: <http://www.fws.gov/birddata/databases/mwi/mwidb.html>

This survey was first conducted in 1935 and is the oldest survey still being conducted annually. It is currently conducted during the first week of January when waterfowl are concentrated to a high degree. The survey identifies winter waterfowl distribution and habitat use throughout the United States. The survey also provides estimates of the size of goose and swan populations and tracks population trends of duck species that nest outside of breeding survey areas.

The Mid-winter Survey is conducted primarily by fixed-wing aircraft, although some states use helicopters and/or conduct counts from automobile or boat in certain areas. The Mid-winter Survey is known as a “cruise” survey, in that specific sampling procedures are not defined. Instead, an aerial crew determines the best and most practical means to conduct a complete count of all waterfowl within a predefined unit area. The exact means of coverage may vary from year to year.

Waterbird Colony Monitoring

Primary Contact: USFWS biologists, Allison Puchniak, and others

URL: <http://www.pwrc.usgs.gov/cwb/>

Currently most data in Montana are collected on National Wildlife Refuges, although MTFWP has been expanding recent inventories. The four known American White Pelican colonies are also monitored. The [Waterbird Conservation for the Americas initiative](#), of which North American Waterbird Conservation Plan is one product, has identified the need to establish a Waterbird Monitoring Partnership. The goal of the Waterbird Monitoring Partnership is to develop a continental network of collaborators who agree to and implement comparable population monitoring techniques and contribute to a centrally managed waterbird database. This continent-

wide waterbird monitoring partnership is being coordinated by the USGS Patuxent Wildlife Research Center's Monitoring Program. Nationally recommended protocols (and other information) can be downloaded at <http://www.pwrc.usgs.gov/cwb/manual/>.

Marsh Bird Monitoring

Primary Contact: Courtney Conway

URL: <http://www.fws.gov/birds/waterbirds/monitoring/marshmonitoring.html>

Marsh birds are generally secretive and must be surveyed with special techniques, usually involving playbacks. Secretive marsh birds in Montana include American Bittern, Pied-billed Grebe, Virginia Rail, Sora, and the occasional Yellow Rail.

The [National Marsh Bird Monitoring Program](#) was created in 1999 to standardize marsh bird survey methodology across the nation so that a variety of parameters could be evaluated (Conway and Gibbs 2005). Montana participation is currently limited to Bowdoin NWR (Fritz Prellwitz), Medicine Lake NWR (Beth Madden), CSKT (Janene Lichtenberg), and Waterfowl Production Areas in northeastern Montana (Allison Puchniak).

Shorebird Monitoring

Primary Contacts: Fritz Prellwitz, Kristi Dubois

Several international programs exist at present to survey shorebirds during migration. The [International Shorebird Survey \(ISS\)](#) was started in 1974 by the [Manomet Center for Conservation Sciences](#) (Howe et al. 2000). Sites are visited every 10 days by volunteers during spring and fall. The ISS data files contain results from more than 80,000 surveys of approximately 1,200 sites widely distributed across the Western Hemisphere. About 1,300 surveys are added each year. ISS data helped spark the formation of the [Western Hemisphere Shorebird Reserve Network \(WHSRN\)](#) and have been used to identify new WHSRN candidates.

The [Western Shorebird Survey \(WSS\)](#) was initiated in 2000 by the US Fish and Wildlife Survey and the US Geological Survey to enhance shorebird monitoring during the non-breeding period, especially in the western United States. The goal of the WSS is to monitor numbers of shorebirds at major stop-over sites, with specific survey areas being chosen to include the most heavily used areas at each site and any areas that are of special interest to local managers. The WSS cooperates, and shares data, with the International Shorebird Survey (ISS) which has been collecting information on shorebird numbers in the eastern and central United States for many years. At present, more than 100 sites are being evaluated for inclusion in the program.

Until recently the design of these shorebird monitoring programs did not allow for a sensitive statistical analysis. A new initiative called the [Program for Regional and International Shorebird Monitoring \(PRISM\)](#) is underway to coordinate and expand on existing shorebird survey efforts, including the ISS, the Western Shorebird Survey and the Canadian Maritimes Shorebird Survey.

Harlequin Duck Surveys

Primary Contacts: Steve Gniadek – Glacier National Park,
Wendy Clark Maples – Lewis & Clark National Forest

Harlequin Ducks have been surveyed at various times and places in Montana by Glacier National Park, the U.S. Forest Service, and the Montana Natural Heritage Program. A new working group

first met in March 2005. They discussed Harlequin monitoring and research, specifically the development of standard protocols for surveys and the establishment of a central database for research and monitoring results. All previous data will first be gathered, and an assessment made of the most appropriate coordinated strategies for monitoring in the future. They are also interested in such things as producing a training video and/or PowerPoint program on Harlequin identification and survey techniques.

Upland Game bird Surveys

Primary Contact: Rick Northrup – MTFWP

We need more information on existing efforts, especially for Sage Grouse and Sharp-tailed Grouse lek counts (see below for Sage Grouse).

Sage Grouse “Adopt-A-Lek” program

Primary Contact: Ben Deeble, [Montana Wildlife Federation](#)

Trained citizens have been used for the past 5 years to gather population data on sage-grouse leks in Montana, Wyoming and Nevada for the National Wildlife Federation’s ["Adopt-A-Lek" Program](#). Citizens volunteer their time for training and field work overseen by NWF and agency staff. They are trained to use appropriate sage-grouse survey protocols for the respective state using GPS units, data forms, topographic maps and other equipment. Most regions do not possess the capacity to obtain replicate counts on a majority of their known sage grouse leks. The objectives of Adopt-A-Lek are to efficiently supplement population and baseline habitat data for agencies to assist in determining grouse distribution and populations, to collect baseline habitat information. In some cases this project allows agencies to task their professional staff with more technical aspects of grouse research and management. In 2004 ninety volunteers were fielded.

Mourning Dove Call-Count Survey

Primary Contact: Jim Hansen

URL: 2004 status report at <http://migratorybirds.fws.gov/reports/status04/Dove.pdf>

The Mourning Dove Call-Count Survey was developed to provide an index to population size and to detect annual changes in mourning dove breeding populations in the U.S. There are 28 (?) routes in Montana (over 1000 nationwide). Each call-count route is usually located on secondary roads and has 20 listening stations spaced at 1-mile intervals. At each stop, the number of doves heard calling and the number seen are recorded. The number of doves seen while driving between stops is also noted. The survey has been conducted since 1966. The resulting estimates of relative abundance and population trends comprise the principal information used in the annual setting of mourning dove hunting seasons.

Monitoring Avian Productivity and Survivorship (MAPS) Program

Primary contact: Institute for Bird Populations, Danielle Kaschube or David DeSante

URL: <http://www.birdpop.org/maps.htm>

The Monitoring Avian Productivity and Survivorship (MAPS) Program was created by the Institute for Bird Populations in 1989 to assess and monitor the vital rates and population dynamics of North American landbirds in order to provide critical conservation and management information on their populations. The MAPS Program utilizes constant-effort mist netting and banding at a continent-

wide network of monitoring stations staffed by both biologists and trained volunteers. In Montana there are 12 banding stations. Six are run by IBP, two by MTFWP, two by the Bitterroot National Forest, one by the Lee Metcalf NWR, one by WREN (in collaboration with the Avian Science Center - see http://www.avianscience.org/research_wrenbanding.htm). All data is sent to IBP for storage and dissemination.

LONG-TERM MONITORING

Survey Objectives: It is critical that the objectives of any monitoring program be clearly stated, especially considering the expense of such programs among many competing priorities for wildlife conservation. Monitoring can and should be much more than the effort to track population trends; it can be a proactive effort to understand the effects of human activities on bird populations (Hutto 1998; IAFWA 2004) and should be an integral part of the adaptive management process.

There have been several recent calls for bird monitoring programs to become more focused on management applicability (Holthausen et al. 2005, Van Horne et al. 2006), perhaps even to the exclusion of long-term “surveillance” monitoring (IAFWA 2004). The Montana Bird Conservation Partnership is in full agreement that a management focus is essential, but there is also a consensus on the desirability of continuing the long-term monitoring of bird population trends throughout the State.

Therefore, long-term monitoring of birds in Montana is one of the primary goals of this Coordinated Bird Monitoring Plan. Most land use activities are not monitored, so a well-distributed, ongoing monitoring program designed irrespective of any particular activity would be a useful tool in exposing cumulative management effects. In fact, long-term monitoring of population trends is essential because: 1) the effects of human activity outside the management area may affect species that reside part-time within the management area, such as land-use patterns in Mexico could affecting populations of bird species that breed in Montana; and 2) bird populations may be declining due to cumulative effects and interactions among multiple factors, which could not be predicted based on single-effect studies. The only way to expose such problems would be through long-term monitoring of the actual population trends. This requires randomly selected, permanent monitoring stations.

The LBMP has been working for many years on ways to move beyond the limits associated with monitoring programs (e.g. BBS) that are built entirely around the generation of long-term trend data. One of these strategies has been to collect habitat data at all monitoring points. In this way, long-term monitoring can be integral to an overall program addressing management information needs. Habitat data allows a wealth of information to be obtained on bird-habitat relationships as well as suggesting potential management issues (Hutto and Young 1999, Young and Hutto 2002). Habitat relationship information is essential for predicting where species are likely to occur, and consequently what habitats are critical for maintaining species populations. This information can be used to anticipate potential impacts of management activities that alter the availability and distribution of habitat. Long-term monitoring thus provides the “pilot” data that fuels our hypotheses about management effects.

The LBMP has also successfully focused on management applications by incorporating special management-effects studies on an alternate-year basis in order to provide important information to managers and partners in the short term. This element of the LBMP program has been appreciated by national monitoring experts and is often recommended for other monitoring programs across the country (Bart 2005). However, the much higher demands of design, site

selection, and training can be prohibitively expensive and difficult to execute *within the framework of the ongoing LBMP*. Therefore, we do not recommend that separate, short-term studies be part of the Montana CBM program in the near future. Although important, such studies would best be undertaken with their own set of proposals, partners, and funding sources. The CBM program can and should, however, address many of these same management issues within the framework of its long-term monitoring design.

In fact, the LBMP has demonstrated the ability to obtain the same types of information on management effects from its long-term monitoring design. For example, an analysis of bird and habitat data collected during routine long-term monitoring has shown effects of forest thinning (versus unthinned forests) that are very similar to results from a special, short-term study of the same issue conducted in 1997 (Young and Hutto 2002b). We are also currently developing other "decision support tools" for managers using regional habitat models based on the long-term survey data (see http://avianscience.dbs.umt.edu/syntheses_habitat.htm).

These types of analyses can be greatly strengthened if the sampling design of the long-term monitoring program is stratified to ensure that there are sufficient numbers of survey points in the various habitats and treatment types of interest, and the LBMP has always recognized that it is necessary to place additional surveys in rare habitats (see "Riparian-specific LBMP Program" below). Such stratification is essential to acquire sufficient data to monitor populations of bird species restricted to rare habitats. Similar stratification can be extended to any habitat of interest, or even different management treatments within specific habitats, such as fuels-reduction projects in dry-forest habitat types, energy development areas, or riparian sites undergoing restoration. In this way, targeted management information can be explicitly guaranteed from the overall monitoring program.

There are specific advantages to gathering long-term data on management effects. Following any disturbance, population trends are more helpful than initial species abundance for determining sustainability. Also, the *variability* of time-series data can tell us more about the quality of local habitats. Yearly variation in environmental conditions can make it *necessary* to consider several years of data for discerning management effects, such as in grassland and wetland ecosystems with high yearly variation in water availability and productivity. Birds may do well in all treatments during years of high productivity, yet demonstrate major differences between treatments in more stressful drought years.

Therefore, we recommend that the Montana CBM program adopt a design that includes elements of both random survey sites and targeted sites under habitat management. Random sites are necessary because the targeted sites cannot by themselves produce overall population trends. The specific management issues to address will be chosen through ongoing discussions with habitat managers and wildlife biologists throughout Montana. The incorporation of such elements does not commit the partners to surveying these sites "in perpetuity," however. If a particular management issue is no longer considered a priority, those sites can be rotated out of the program, to be replaced by new sites representing more immediate management concerns.

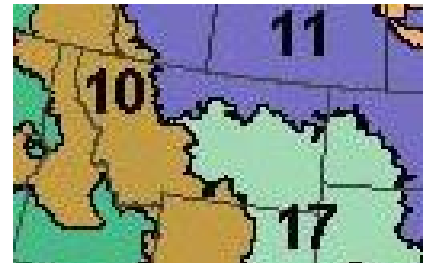
What species to monitor? Identifying species at risk requires information on all species regularly found in Montana, and information must be collected throughout Montana. Appendix 1 provides the full species list, along with the recommended monitoring protocol(s) for each species (summarized in Table 1). This list was prepared using the general criterion that we should monitor species we would attempt to conserve if we knew they were declining. It totals 230 species, which includes all game and nongame species that breed regularly in Montana, but does not include introduced species or species at the very edge of their range in Montana.

However, it may not be necessary to monitor every single bird species. One of the main advantages of monitoring birds is that it is a very efficient way to measure indicators of a wide variety of ecosystems using a few simple protocols. Special surveys of single species is not mandated or cost-effective, *unless they are considered indicators of important management issues or are otherwise thought to be threatened with population declines*

Quantitative Objectives: For all species groups, we use the accuracy target for trends proposed by Bart et al. (2004) – building on earlier work by Butcher et al. (1993) – of 80% power to detect a 50% decline, occurring during no more than 20 years, using a significance level of 0.10, and incorporating effects of potential bias. For many nongame species, estimating trends solely for Montana with sufficient precision is probably not feasible (Bart et al. 2004). Instead, information from Montana will need to be combined with information from surrounding states to achieve targets for a larger proportion of each species’ entire range. Cooperation across state lines will be encouraged by using Bird Conservation Regions for planning (see next section).

Ecoregional stratification of the State

When designing a state-wide program such as CBM, it is often useful to plan surveys in relation to known differences in ecological communities across the state, and to also use these communities as templates for collaboration across state lines. In this plan, we use Bird Conservation Regions (BCR) for our ecoregion designations. These regions were designated by the North American Bird Conservation Initiative (NABCI), which was formed as an international forum for coordination of conservation efforts of existing major bird initiatives (i.e., landbirds, waterfowl, waterbirds, shorebirds). One goal of NABCI is to increase the effectiveness of, and coordination between, existing and new bird conservation programs. As a recommended framework for coordinated bird management, NABCI adopted and mapped ecological units called Bird Conservation Regions (see <http://www.nabci-us.org/bcrs.html>). BCRs are ecologically distinct regions with similar bird communities, habitats, and resource management issues. Montana is covered by three BCRs (see map, right; Northern Rockies, BCR-10; Prairie Potholes, BCR-11; and Badlands and Prairies, BCR 17).



Program Elements

Monitoring the wide diversity of bird species occurring in Montana requires a number of different survey methods appropriate to the habitats and behavior of each species group. Survey methods for each element of the long-term monitoring program will follow the national recommendations of a panel of experts at the continental level who have evaluated which methods best estimate long-term trends in population size. Some species of concern will need to have special sampling efforts focused on them. These recommended methods are listed in Appendix I for each species and summarized in the following table.

Table 1. Number of species that would be monitored by each major survey method. Some species are counted under more than one method (see Appendix I). Ranges in numbers are due to uncertainty whether or not some methods will work best for particular species.

Survey Method	Season	# Species
Point counts for landbirds	Breeding	147-165
Diurnal Raptor surveys	Breeding	8-11
Area surveys for aquatic birds	Breeding	41-46
Colony counts	Breeding	13-15
Aerial surveys for waterfowl	Breeding	15-18
Nocturnal surveys	Breeding	10-12
Species-specific surveys	Breeding	18-28
Migration monitoring (shorebirds)	Migration	14-20

1a. Landbird Monitoring Program (LBMP)

Existing Surveys: Current partners (2004) and survey efforts for the geographically stratified transects of the LBMP in Montana are summarized in the following table.

Sponsoring Organization	Transects
U.S. Forest Service	268
Bureau of Land Management	57
Montana FWP (SWG)	55
Conf. Salish-Kootenai Tribes	26
Glacier National Park	25
Total	431 transects

Sampling Plans: The majority of breeding bird species in Montana can be monitored using standard point-count survey techniques (generally “landbirds”). These will be monitored throughout Montana by continuing the expansion of the Landbird Monitoring Program. The sampling design will involve a combination of geographically stratified and habitat-targeted monitoring points to distribute efforts across Montana, while also adequately sampling all necessary habitats.

LBMP transects have typically been placed along tertiary roads and trails (embedded in a random design). There has been much concern that this sampling design may bias the results (e.g., Ellingson and Lukacs 2002). According to sampling and statistical theory, we can only make inference about what we have sampled. Bird population trends and habitat associations along roads may be similar to off-road, but this has not been tested sufficiently (but see Hutto et al. 1995 for abundance comparisons).

For these reasons, the LBMP is presently exploring grid-based sampling as an alternative to road-based transects. Probabilistic grid sampling, either across the landscape or targeting specific habitat types, offers a scientifically defensible survey design (simple random samples), removes the road effect associated with the original LBMP design, is likely to contain fewer “hard” or significant edges, and allows for better use of spatial statistics. A grid system’s primary disadvantage lies in the reduction in number of point counts which can be completed in a given day; however, the ability to make stronger inferences across broader areas helps offset such disadvantages.

This evolution reflects the interest of the ASC and LBMP's primary partner, the Forest Service, in meshing landbird monitoring with the National Forest Inventory and Analysis Program (FIA) grid. Visiting FIA grid points would allow bird data to be used along with standardized vegetation data collected at the point and, potentially, with low-elevation aerial photography, and this should then allow for better development of habitat models. In addition, the grid-system may also work well with the Multi-Species Inventory and Monitoring approach (MSIM; a national framework for monitoring species at a broad scale) currently being developed within the USFS. Such a system should ultimately save resources, as data on a number of taxa can be collected simultaneously.

In 2006 the LBMP initiated a pilot study of grid-based point counts on 3 Forests and one BLM district; 2 of the forests have an FIA intensified grid system in place. We used a 10 minute count, and visited all points twice. We also tested designs for targeting rare habitat elements, because strictly random point selection will not provide information on the rare habitats where many bird species reside.

As noted, however, off-road samples introduce issues of cost efficiency, safety, and the ability to relocate points in dense forests (where GPS may not work). Initial results suggest safety and GPS reliability were not problematic. Further assessments from this pilot season will elucidate issues of efficiency, logistics, and specific design (# of points surrounding grid points), and the results and further review will help inform the larger CBM efforts.

Overall, the intent is to continue grid-based sampling on a yearly basis. Because of reduced cost efficiency, however, it may be necessary to have a combined design using new grid-based surveys in conjunction with the more efficient road- or trail-based transects already in place. The latter have already accrued 10 years of time-series data, and they can be revisited in any year to continue trend monitoring.

Protocols: Survey protocols and methods manuals established for the LBMP can be downloaded from the Avian Science Center web site (http://www.avianscience.org/research_landbird.htm). We are also now recommending that all survey points be visited at least twice per year (to allow for a more complete bird list and a better understanding of detection probabilities).

Needed Information: Our most important need is better collaboration with Montana Tribes. The Confederated Salish and Kootenai Tribes have been a partner since 1996, but other Tribal lands in Montana can be seen as obvious gaps in our geographic coverage (see map, previous page). Inviting all individual Tribes into our network of partners will make a stronger and more comprehensive program for all elements of this CBM plan. Surveys on tribal lands could be conducted by Tribal members, Reservation biologists, ASC employees or others.

Project Management: Coordination will continue to be provided by the Avian Science Center for all elements of the LBMP. We have found that it works well to use primarily seasonal technicians who are hired by participating partners but then trained and supervised in the field by Avian Science Center personnel. It may also be useful for the ASC to hire technicians directly in order to have more flexible "rovers." All information will be entered into a central database through a web interface maintained at the Avian Science Center. Access to raw data, data analyses, and data summaries will occur primarily through the same web portal, as well as hard-copy annual reports.

1b. Riparian-specific LBMP Program

Riparian habitats are a high priority for habitat-based bird surveys because they support a high diversity of birds, are poorly sampled by random transects, and are especially threatened by

habitat loss and degradation. Species restricted to riparian habitats pose special challenges to monitoring. A monitoring program specifically designed to efficiently survey these habitats is necessary, and we therefore consider this as a separate element in the CBM plan.

Survey Objectives: The main objective is to adequately monitor population trends of all riparian-associated bird species that are not sufficiently covered by our geographically stratified transects. Data from the Madison/Missouri efforts and continuing pilot work will help determine needed sample sizes. Our work to date has been focused on cottonwood bottomland habitats, but we plan to do additional work on smaller streams dominated by willow and other shrubs, as well as hardwood draws in eastern Montana. It is noteworthy that the current Implementation Plan for Montana's Comprehensive Fish and Wildlife Conservation Strategy emphasizes smaller mountain and prairie streams.

Existing Surveys: The Avian Science Center has recently been working with PPL Montana and the BLM to implement a riparian-based monitoring protocol on a 541-mi Madison/Missouri project area. We randomly located 30 transects (each within a geographically stratified river reach), and surveyed these in 2003. We discovered that riparian habitat is sporadically located and therefore not sufficiently targeted using this design. We found it necessary to delineate patches of riparian habitat using aerial photos or DOQs (unless adequate GIS layers are already available, which is rare for riparian habitats). A new sample of sites was selected from these target patches and surveyed in 2004 and 2005. We recommend a similar site selection plan for other major rivers in the state.

Sampling Plan: Many of the factors influencing riparian birds operate at large spatial scales (e.g. habitat availability and configuration, landscape context). In order to analyze the influence of these effects, we will be using a watershed-based sampling design (4th code hydrologic units) where watersheds are randomly selected within each BCR (Figure 2). Excluding the Madison/Missouri project, a total of 18 watersheds have been selected for monitoring (Table 2). Additional watersheds may be added or prioritized to dovetail this effort with the Montana Comprehensive Wildlife Conservation Strategy and to expand survey efforts. To most efficiently target riparian forest, surveys will be limited to watersheds with large rivers (4th order or greater) that have sufficient riparian habitat. In future years, we can efficiently expand the survey effort to additional riparian habitats within each selected watershed.

Figure 2. Map of watersheds sampled in Madison/Missouri Project, and additional selected watershed for monitoring within each BCR in Montana

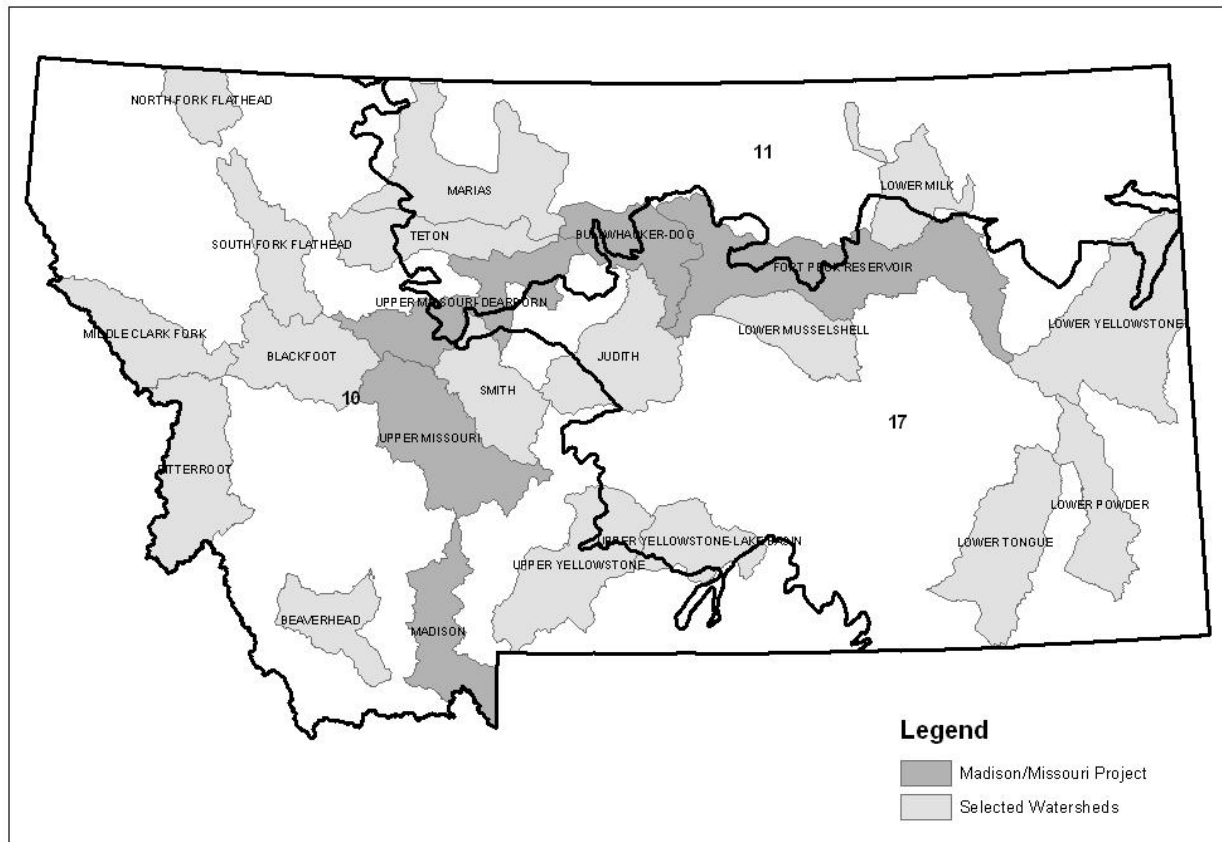


Table 2. Watersheds (4th code HUC's) selected for riparian forest habitat monitoring (this list will be finalized after 2005 field season)

BCR	Watershed Name
10	Beaverhead
10	Bitterroot
10	Blackfoot
17	Judith
11	Lower Milk
17	Lower Musselshell
17	Lower Powder
17	Lower Tongue
17	Lower Yellowstone
11	Marias
10	Middle Clark Fork
10	North Fork Flathead
10	Smith
10	South fork Flathead
11	Teton
10	Two Medicine
10	Upper Yellowstone
17	Upper Yellowstone-Lake Basin

Riparian forests occur discontinuously along waterways in linear bands of highly variable size. The standard Landbird Monitoring Program protocol of 10 sample points per transect is not an ideal method for surveying this habitat type, because it does not permit sampling smaller patches (<1km in length) that represent much of the available riparian forest habitat. Therefore, sites will be selected following sampling protocols designed to sample habitat patches. Within each selected watershed, 15 riparian forest patches will be randomly chosen. For each patch, we will overlay a 150m x 150 m grid parallel to the main axis of the riparian patch, with a potential point count location in the center of each grid cell. All potential point locations within each patch will be surveyed (1-8 points/patch).

Needed Information: We need more information on past river surveys, their sampling protocols, and whether they could be repeated as part of the overall design. We need inventories of navigable river reaches and all public access points. We need to make sure we are very clear on the rules (both legal and cultural) regarding stream access. If we plan to use private property (important for unbiased sampling, but tricky because long-term access can not be assured), we will need ownership records and a coordinated system for contacting landowners (so they are not called by multiple people looking for different kinds of surveys or conservation opportunities, etc.).

Project Management: Coordination will continue to be provided by the Avian Science Center as part of the Landbird Monitoring Program.

2. Breeding Bird Survey

The Breeding Bird Survey (BBS) uses point counts, but the specific protocols are different from those used in the LBMP (3 minute counts, 50 stops, ¼-mile intervals, larger roads). We are not using the BBS methodology for the statewide landbird surveys, because of concerns about count duration, hurried pace, lack of vegetation data, roadside bias, and reliance on untrained observers. Instead we will complement the BBS by placing additional points in quarter-latilongs that do *not* have BBS routes, in order to maximize our geographical coverage of the state (Appendix II). Currently, the BBS provides at least marginally adequate coverage for about 25-35 of the more common priority bird species in Montana, and 50-60 non-priority species. Coverage of all of these species will be expanded by the point-count projects outlined in this CBM plan.

Protocols: Instructions for conducting Breeding Bird Survey routes can be found at: <http://www.pwrc.usgs.gov/bbs/participate/instructions.html>

Project Management: The BBS system will remain as it is in Montana (with 56 official and 9 non-random routes). However, partners should make a commitment to full participation in the BBS program, and should work to ensure that all established BBS runs are consistently run so that we avoid the kinds of gaps that have occurred in the past. If we can not find enough highly skilled volunteers, agencies should allow their biologists time to run routes (if they are not already doing so). We will also explore ways to train observers for species identification skills as well as more rigid adherence to protocols, in cooperation with ideas on these subjects being discussed and implemented at the National level.

The BBS and LBMP surveys can be analyzed separately to provide corroboration for each other, or it may be possible to increase the strength of the overall CBM program by using the BBS data for the state in combination with the LBMP and other data (Sauer 1999).

3. Diurnal Raptor Monitoring

Existing Surveys: Montana Fish, Wildlife, and Parks currently coordinates 46 long-term Raptor Survey Routes across the state. These are essentially point count methodologies set up similarly to the BBS, but surveys are done at a different time of day with observers focused on a specific set of species. This is an excellent program that should be continued.

Needed Information: Coverage of existing surveys should be examined to determine if existing monitoring efforts are adequate for surveying each species. Monitoring needs for forest *Accipiters* will also need to be reviewed.

Long-lived species with sparse populations may require more intensive monitoring efforts to detect changes in abundance, such as direct measures of nest occupancy and fledging success. These species include Bald Eagles, Peregrine Falcons, Ferruginous Hawk, Northern Goshawk, and Golden Eagle. Bald Eagles and Peregrine Falcons are already being monitored by MTFWP and USFWS, respectively.

Project Management: Presently volunteer coordination is done by MTFWP; they are seeking funds to cover coordination of field efforts and compilation and analysis of data collected.

Protocols:

Midwinter Bald Eagle Surveys

http://srfs.wr.usgs.gov/research/indivproj.asp?SRFSProj_ID=2

North American Raptor Monitoring Strategy:

http://srfs.wr.usgs.gov/research/indivproj.asp?SRFSProj_ID=7

4. Aquatic Bird Program

Survey Objectives: A large number of bird species of conservation priority are highly reliant on wetlands for breeding and migration habitat. These are highly discrete sites that must be specifically targeted and searched with methods appropriate for the each species. Montana's aquatic bird monitoring program will 1) help to clarify the distribution of wetland-dependent species, and 2) monitor their populations in relation to the amount and suitability of the state's wetland resources to these species.

Existing Surveys: There have been very few extensive surveys of the distribution of single species in Montana (e.g. Rauscher 2000), or inventories of all wetlands across any significant portion of the state (e.g. Reichel 1996, Feigley 1997). Good regional trend data are not currently available for most shorebirds and waterbirds in Montana (or anywhere else), although several local efforts have produced important survey data for some sites (e.g., Benton, Bowdoin, and Medicine Lake National Wildlife Refuges).

Sampling Plan: The program will follow the design recommendations of the national Coordinated Bird Monitoring (CBM) committees. By following their approach, Montana's survey data can be stepped up to inform regional efforts. The final Coordinated Bird Monitoring model for Montana will require the joint efforts of many partners to ensure that such surveys are well designed to complement historic and ongoing survey efforts at these key sites.

Aquatic bird monitoring will be conducted at a combination of discrete wetlands known to support

high concentrations of aquatic focal species and at randomly selected wetlands to adequately monitor more dispersed species (Table 3). Collectively, aquatic species require a variety of specialized survey techniques. All relevant surveys will be conducted at both “discrete” and “dispersed” sites; however, sampling designs for the discrete sites, which are often large and complex, will often need to be site specific.

Table 3. List of aquatic focal species targeted by discrete and dispersed site surveys.

Discrete	Dispersed
Western Grebe	Pied-billed Grebe
Clark’s Grebe	Horned Grebe
Eared Grebe	<i>Anas</i> and <i>Aythya</i> ducks
American White Pelican	American Bittern
Black-crowned Night-Heron	Virginia Rail
White-faced Ibis	Sora
Black-necked Stilt	American Avocet
Franklin’s Gull	Wilson’s Phalarope
Caspian Tern	Black Tern
Forster’s Tern	Common Tern
	Transient Shorebirds

Protocols: For Montana surveys to be part of a continent-wide monitoring program, it is essential that methods be developed and agreed upon that are consistent and comparable. While the basic forms of rigorous aquatic bird surveys are well developed, specific nation-wide standards have not yet been adopted. The [North American Waterbird Conservation Plan](#) calls for development of a set of standardized waterbird monitoring methods to be developed for both population and habitat at multiple geographic and temporal scales. As part of the conservation plan, a manual of recommended standardized breeding season population monitoring methodologies has been produced for use by resource agencies and NGOs, and will be updated as methods are further improved and tested (see <http://www.pwrc.usgs.gov/cwb/manual/>). The purpose of the monitoring manual is to provide guidance to individuals developing new waterbird monitoring programs, or interested in improving data comparability.

Secretive marsh birds will be addressed by expanding participation in the National Marsh Bird Monitoring Program: <http://www.fws.gov/birds/waterbirds/monitoring/marshmonitoring.html>

The following standard protocol has been adopted for this program:

http://www.fws.gov/birds/waterbirds/monitoring/conway_and_nadeau_SSP_marsh_bird_final_report.pdf

Data Management: Data repositories are currently being developed for waterbird survey data. Basic inventory data and anecdotal records should be sent to the Montana Natural Heritage Program (<http://nhp.nris.mt.gov/NHIP/>). MNHP already performs this function for at least historic element occurrence (distribution) data for many of these species at these sites. Larger, long-term data sets should be sent directly to a collection node for the Avian Knowledge Network. There are currently two different web sites soliciting such data sets, one with a continental scope (<http://www.pwrc.usgs.gov/cwb/database/>) and one for the intermountain West (<http://greatbasin.nbii.gov/IWCBM/default.asp?PageID=6>). These will eventually both become part of the Avian Knowledge Network, but until this is sorted out we recommend contacting Ann Manning at the IW CBM for advice on how to start converting your dataset for upload.

4a. Discrete Sites

For many wetland bird species, a large percentage of their populations can be surveyed by concentrating on a limited number of wetland complexes. These include birds that nest in colonies (e.g. pelicans, terns, herons, etc.) and species that prefer to breed in large wetland complexes (e.g., Western Grebe, Forster's Tern, etc.).

To adequately monitor focal species with geographically concentrated colonies and other aquatic focal species restricted to large wetland complexes, which are not likely to be covered in random samples, annual intensive surveys at all known sites supporting substantial numbers of each species are necessary. We are compiling an inventory of all wetland sites in Montana with known or suspected breeding populations of priority species. The results of this effort are presented in Appendix IV. We have identified 50-60 key sites in the state that should be surveyed thoroughly on an annual basis for the species listed in the left column above (other species will also be recorded, of course). Specifically, these aquatic site assessments describe the sites that need to be included in statewide surveys, the most important areas within these sites, existing survey efforts, and recommended site-specific survey methods for species of interest driven by the timing of breeding events, known relationships to water level fluctuations, and site topology. If we do not have sufficient resources to monitor all sites, a logical sampling plan will be developed, as may also be necessary within some of the larger wetland complexes.

Needed Information: Our inventory of sites that should be regularly monitored is not complete (Appendix IV). We need local experts to help extend the list and fill in the information for each, so we can identify information already available and gaps in data that need to be filled and design site specific methods for species of interest that complement historic and ongoing survey efforts. ASC has agreed to take the lead in completing these assessments.

Project Management: Because many of the key colony sites in Montana occur on publicly-owned wetlands managed by agencies with permanent or seasonal staff, our focus should be on outreach and development of the resources and impetus necessary to have the relevant partner agency (e.g. USFWS) conduct or fund the surveys on a site by site basis. Surveys already occurring, such as on National Wildlife Refuges, may simply need to be incorporated into the overall framework.

Volunteer networks will be used as appropriate, especially for the checks of known locations of priority species. The Rocky Mountain Bird Observatory has implemented a Colony Watch program in Colorado which maintains a register of volunteers who each survey one or more colonies on an annual basis. We believe this approach has merit, but the density and distribution of qualified birders in Montana might preclude a comprehensive program of this type at this time. Because most of the sites we have identified for preliminary consideration have also been identified as candidates for state Important Bird Area designation, Montana Audubon should play a key role in the development of a volunteer work force for these surveys.

4b. Dispersed Sites

Many other wetland bird species are dispersed among smaller as well as larger wetlands, and a large percentage of their populations would not be surveyed at the priority wetland sites. To clarify the distribution of these wetland-dependent species, as well as to monitor their populations in relation to the amount and suitability of the State's wetland resources, surveys will be conducted regularly at randomly selected wetlands. Researchers have been working on stratified approaches to wetland inventories (e.g. Skagen et al. 2003). To get a representative sample of the more dispersed wetland species, we have begun to select a stratified (by type and size) random sample

of wetlands across the state. We will select random subsets of wetlands from each of 4 categories: marshes, lakes <30 ac, lakes 30-640 ac, and lakes >640 ac in size. Eventual sample size will be 120 sites (30 each), distributed evenly across the state. An example of this selection process is shown in Appendix III.

We will follow national standardized survey protocol guidelines, although consistent and comparable methods are still needed for many non-colonial aquatic birds. For efficiency, all of the techniques we use will be performed on the same visit to each wetland. Site visits will be timed to represent the peak of the nesting season for the broadest range of species, and also the time period when water levels are highest (June throughout most of Montana). Preferably two visits will be made to each wetland surveyed, once during the first half of the month, and once during the second half, with the visits at least 2 weeks apart. This will require a tradeoff with the number of sites that can be monitored.

Project Management: Surveys will be coordinated in a statewide networking effort that includes all agencies in the state with an interest in wetland bird surveys, in order to maximize existing monitoring efforts and determine how best to meet additional monitoring needs through a combination of technicians and volunteers. The Montana Wetland Monitoring and Assessment Program (MTDEQ) may wish to help with this effort.

5. Waterfowl Monitoring

Existing Surveys: In Montana, aerial surveys are completed for the northeast 2/3 of the state (BCR 11 and, less intensely, BCR 17) as part of the Waterfowl Breeding Population & Habitat Survey.

Needed Information: Populations in western Montana (BCR 10) may be sufficiently monitored by wetland area searches and riparian point counts (especially if river-running surveys are included). Cavity-nesting ducks might be covered by wetland area searches if we target the appropriate forested lakes (along with Red-necked Grebes and Common Loons), or they may be better surveyed on their wintering grounds.

Project Management: MTFWP, USFWS, as currently operated.

6. Nocturnal Surveys

Sampling Plans:

We will use the Bird Studies Canada protocol (<http://www.bsc-eoc.org/regional/owlguide.html>), which involves 10 stops placed 1 mi apart (for most owls; Flammulated Owl surveys occur ~500m) and which relies on a combination of passive listening and callback techniques. Monitoring points will be located within appropriate habitats and stratified geographically using latilongs. Sites will be selected from among the point count transects and positioned by overlaying and extending the already existing transects.

These surveys need to be conducted during two parts of the season, March/April for most owls, which may begin breeding in February or even January, and May/June for Flammulated Owl and Common Poorwill. The latter are essentially single-species surveys that may be managed separately.

Project Management: These surveys could be conducted as a citizen science effort in combination with the efforts of hired point counters, and may be coordinated by Montana Audubon, the Avian Science Center, the Owl Research Institute, or a collaboration between any of these.

7. Upland Game Bird Surveys

Needed Information: We need to confirm that monitoring efforts will be adequate for Sage Grouse and Sharp-tailed Grouse, and that the necessary coordination is in place to assure consistency in those programs and information sharing. Networking with the Western Agencies Sage and Columbian Sharp-tailed Grouse Technical Committee, as well as individual stakeholders, will be important.

We may also want to consider a plan to monitor forest grouse (especially Blue Grouse, a species of concern).

Project Management: MTFWP, depending on species. Sage Grouse is probably a special case.

8. Species-Specific Surveys

Survey Objectives: Appendix I lists 18-28 species that may require special efforts to monitor. We may decide not to monitor some of these, especially if there is no reason for concern for a particular species. However, many of these species are of high concern and will need to be covered. Within-state trends will probably not be possible for these species (and many others).

Existing Surveys: Common Loon, Bald Eagle, and the endangered species are already covered.

Sampling Plans: We will borrow from existing state (and in some cases trial) protocols (e.g. OR/WA and CO) for some special species, especially Black Swift and Harlequin Duck. Sites will be identified and surveyed on an annual basis. For other species (e.g. Sage Grouse, Burrowing Owl, Mountain Plover), there are already monitoring networks being established. These will need to be evaluated and expanded as necessary. We recommend undertaking some of these surveys as a citizen science effort coordinated by the Montana Natural Heritage Program, the American Bird Conservancy, and Montana Audubon.

9. Shorebird Migration

Montana wetlands serve as important migration and staging habitats for a wide variety of transient shorebird species. About twenty species of non-breeding shorebirds migrate regularly through Montana (Casey 2000; <http://biology.dbs.umt.edu/landbird/mbc/mtpif/mttrans.htm>). Montana's transient shorebirds migrate primarily through the wetlands of the central and eastern region of the state, though many are seen in the wetlands of the higher elevation in the western part of the state.

The current implementation plan (2005 -2011) for Montana's Comprehensive Fish and Wildlife Conservation Strategy targets shorebirds as the highest priority bird group for conservation and monitoring, partly because we know very little about their movements and habitat use during migration.

Survey Objectives: The goals of the shorebird surveys is to locate key migration sites and to produce good estimates of the average number of shorebirds present during the migration period for each focal species, along with their habitat selection and management needs. Because of the fluidity of migratory pathways and schedule, it is doubtful that population trends can be measured.

Existing Surveys: Several international programs exist at present to survey shorebirds during migration. In Montana, Benton Lake and Bowdoin National Wildlife Refuges, Montana's two WHSRN sites (<http://www.manomet.org/WHSRN/sites.php>), as well as Medicine Lake NWR currently participate in the Western Shorebird Survey. Shorebird monitoring also occurs at the

Stone Container ponds near Missoula.

Sampling Plans: The current surveys will continue, but we will work with the [Program for Regional and International Shorebird Monitoring \(PRISM\)](#) to determine the best sampling design and protocols for monitoring migrant shorebirds in Montana. PRISM is working to standardize approaches to site selection and data collection, develop a common data base, and increase efficiency. The closer coordination and expanded survey effort will increase the power of statistical analyses and more clearly define shorebird conservation issues on a continental scale.

Shorebird monitoring can be conducted at the same wetland sites as the rest of our aquatic bird program (Appendix III and IV). We have taken transient shorebirds into consideration when selecting sites. However, these surveys need to be done at different times of the year (depending on the protocol, several visits in the fall and sometimes in the spring as well). We are discussing ways to coordinate field technicians so that they can perform a variety of such time-specific surveys while being employed for several months, if not year-round (by MTFWP or ASC).

Protocols: <http://www.pwrc.usgs.gov/monmanual/techniques/shorebirdsnonbreedingsites.htm>

Needed Information: We need to choose focal species based on continental concern and abundance in Montana. We need to include shorebird information in aquatic site assessments (Appendix IV), and determine which species will need to be monitored at dispersed sites.

Project Management: Existing sites can continue to be surveyed with the coordination of the Western Shorebird Survey, but they might not be able to coordinate the number of sites we want to monitor in Montana. MTFWP or ASC will probably have to contribute.

ADDITIONAL MONITORING NEEDS and STRATEGIES

Demographic Monitoring

At present, this plan emphasizes the acquisition of broad-scale abundance data that can then be used to expose habitat association patterns or apparent land-use effects. Point counts and other monitoring techniques that provide only an index of abundance do not provide estimates of reproduction, survival, or population growth, and, therefore, are often criticized (e.g., DeSante and Rosenberg 1998). While such demographic estimates can be very important and are lacking from point-based abundance data, this plan emphasizes abundance data for the following reasons:

First, while it has become axiomatic in the bird-habitat relationships literature to note that indices of abundance or density do not necessarily reflect the breeding success of a bird species in different habitats (e.g., Van Horne 1983, Vickery et al. 1992, Brawn and Robinson 1996), it appears that relative abundance really is an adequate indicator in the majority of cases (Bock and Jones 2004). Further research is needed to elucidate when this may not hold (e.g. ecological traps), research potentially conducted by specific University or Agency led studies, or even alternate-year work as determined by the CBM Steering Committee.

Second, measuring demographic parameters (e.g., nest success, survival, etc.) is very expensive and often geographically limited in scope, and it is arguably most useful to specific situations or species where an understanding of such parameters is critical to decision making. Thus, there are obvious trade-offs in knowledge gained, spatial and temporal inference, and cost.

Third, in comparison to a more detailed understanding of local populations, sampling broadly across the entire state provides an approximation of habitat relationships and population trends for a suite of ecologically diverse species. This type of information is difficult to attain with demographic studies. We do recommend, however, that estimated abundance patterns from point-based data should be supplemented with mechanistic studies based on demographic data to confirm probable explanations for trends or management effects.

There are a handful of ongoing long-term nest monitoring studies in Montana that hopefully will continue; we are aware of studies involving loons (Bissell 2002), ducks (e.g. Ball et al. 1995), and bald eagles (see above). Other demographic studies in Montana (with a scope that could be useful for continued monitoring) have included: Ensign 1983, Tewksbury et al. 1998, Hansen and Rotella 2002, Dieni and Jones 2003, and continuing work by David Naugle and his students and Richard Hutto and his students at the University of Montana.

One other program for demographic monitoring with study areas in Montana is the Monitoring Avian Productivity and Survivorship (MAPS) program (DeSante et al 1999). This program has the potential to provide some regional indices of productivity and survival over a broad area, although it would need to be greatly expanded to achieve reliable demographic indices for even a limited number of species.

Migration Monitoring

Another monitoring need outside the scope of this plan includes birds migrating through Montana (except for shorebirds, discussed above). Not all birds found in Montana actually breed here, and yet they still use habitats and resources provided herein. Of special importance are the vast numbers of songbirds that breed in boreal and arctic Canada.

Most of the species that migrate through Montana are traveling to remote breeding grounds where it would be very difficult to monitor them during the breeding season. As many of these species also winter in Latin America, their passage through the United States may provide the best opportunities for monitoring their populations. Considering the broad swath of territory within Montana, the state has some responsibility to help in the continental effort to monitor these species.

A more direct reason for monitoring migrants in Montana is that habitat along migration routes can be just as crucial to the survival of a species as good breeding or wintering habitat. Land management decisions in Montana can therefore play a major role in the population trends of bird species that do not even breed here. While it would be difficult to connect population changes with management of stopover habitats in Montana, it is still possible to quantify the effects of such management by special techniques such as blood lipid analysis. This would be considered research and is beyond the current scope of this proposal.

Current monitoring of migrant birds in Montana is mostly limited to two raptor migration observation areas and several efforts at monitoring transient shorebirds, most notably at the two Western Hemisphere Shorebird Research Network (WHSRN) sites in Montana (Benton Lake and Bowdoin National Wildlife Refuges). We strongly encourage expansion of these efforts.

While we are not providing detailed migration monitoring plans here, we recommend that Montana partners work toward participation in the emerging North American Migration Monitoring Network. This network, now recognized by Partners and Flight's Monitoring Working Group and the North American Bird Conservation Initiative, is working to coordinate the efforts of individual monitoring stations and regional bird monitoring efforts. This network will strive to increase our understanding

of the entire life history of migrants as well as facilitate cooperation on international conservation efforts. It will bring benefits such as: increased sample sizes, collaboration, centralization of data storage and analysis, standardization of methods, and enhanced funding opportunities due to common focus. The North American Migration Monitoring Network will make broad-scale analyses of habitat use patterns, stopover ecology, and migratory connectivity much more feasible. The reality for a migration monitoring network to contribute to identification and conservation of important stopover habitats in each region continues to grow. Standardized methods have been developed for counting birds on migration (Hussell and Ralph 1998). These methods, which involve a combination of standardized banding, and standardized daily counts, are now in use at a chain of stations all across southern Canada and the northern U.S. -- the Canadian Migration Monitoring Network (<http://www.bsc-eoc.org/national/cmmn.html>)-- providing us much needed baseline data on population trends of northern breeding birds.

Winter Monitoring

Relatively few bird species remain in Montana throughout the winter season, but this can be a critical time in the population cycle for the ones that do, especially for some species (e.g. Sharp-tailed Grouse) that seem to have more specialized habitat needs in winter than in summer. The expense and logistics of winter field work, however, especially in the snow-covered backcountry, will likely continue to make this an unmet need. Unfortunately, the Christmas Bird Count will probably remain the only program attempting to monitor wintering birds in Montana for some time to come.

PROPOSED ACTION PLAN

To implement a Coordinated Bird Monitoring plan in Montana, we propose a division-of-labor approach that shares the burden of implementation among the program partners. An important step is deciding which of the participating organizations will take responsibility for each component of the plan. To facilitate further discussion of the implementation process, we provide here a preliminary list of the program elements, the potential lead agency/organization for a given element, and current status of its implementation (Table 4, below and next page).

Coordination of all plan elements will need to be centralized, and this should probably be done through either Montana FWP or the Avian Science Center. The role of the Avian Science Center could be to provide technical expertise in design and analyses, to help partners identify gaps in monitoring coverage, and where possible, provide additional labor to implement the monitoring work. The Avian Science Center and the Natural Heritage Program can work together to provide a data network that accommodates queries from partners. Technical oversight on all aspects of the program can be provided by the Avian Science Center, the USGS Snake River Field Station, and through the formal peer-review process involved in the publication process.

Table 4: Summary of Coordinated All-Bird Monitoring Program primary long-term elements, agency / organization(s) offering to be the lead in implementation, funding mechanism, and current status. CBM Plan Steering Committee members and others please help to fill in and modify this table during their review.

Coordinated All-Bird Monitoring Program element	Agency / Organization(s) to take lead in implementation	Funding mechanism	Current status of implementation (as of summer 2005)
Landbird Monitoring Program (point counts)	ASC	Federal agencies (USFS, BLM), MTFWP, MNHP, CSKT, Plum Creek, TNC	Primarily in place. Need commitment from BLM, MTFWP, and others. Need to work with additional Tribes
Riparian-specific Landbird Monitoring Program (point counts)	ASC	MTFWP, PPL-MT,	Pilot program in 2005 (SWG) PPL-MT committed to some ongoing work on Madison/Missouri
BBS point counts	Volunteers (many within agencies)	None	On-going. More effort needed to insure complete coverage.
Diurnal raptor monitoring	MTFWP, USFWS (Falcon)	MTFWP, USFWS	On-going. Data sharing improvements?
Aquatic bird monitoring - Dispersed sites	MTFWP ASC? Audubon?	MTFWP? MTDEQ?	Little in place. Need commitments to establish program. Need to build up shorebird portion.
Aquatic bird monitoring Discrete sites	MTFWP Audubon ASC?	MTFWP, USFWS Volunteers thru Audubon?	Misc. efforts at NWRs; coordination needed with aerial surveys for waterfowl monitoring; need to build up shorebird portion
Waterfowl monitoring	USFWS, MTFWP	State funds, hunting licenses	On-going and well-implemented in NE 2/3 of Montana. Need to add western component. Possible data sharing improvements?
Upland game bird monitoring	MTFWP? Depends on species	State funds, hunting licenses (??)	Some elements implemented, but would benefit from add. funds to cover additional species (spruce and blue grouse)
Raptor migration monitoring	HWI, RVRI, USFWS	Non-profit efforts	On-going at Roger's Pass and Bridger Mountains. Consider similar programs at other traditional migration sites.
Nocturnal Surveys	ASC? ORI?	USFS, MTFWP, ORI, ABC, Volunteers thru Audubon?	ORI for Long-eared Owls is implemented; USFS has pilot Flammulated Owl - need commitment for continuation after 2005. Needs expansion to other species.

Coordinated All-Bird Monitoring Program element	Agency / Organization(s) to take lead in implementation	Funding mechanism	Current status of implementation (as of summer 2005)
Migrant shorebird	MTFWP	MTFWP, USFWS?	Ongoing at major Wildlife Refuges only
Black Swift	ABC	volunteer	A few recent surveys
Harlequin Duck	MNHP,USFS,GNP	??	Working group formed

Program Coordination and Administration

An essential aspect of any monitoring program is the ability to get results into the hands of participating partners and managers as quickly as possible, and in an understandable and usable form. Too many monitoring data collection efforts over the years have produced notebooks full of data that may or may not be still sitting on somebody's shelf. One of the more exciting aspects of this plan will involve the directed pursuit of information relevant to managers, and the continuing development of innovative ways to synthesize and disseminate these results, through reports, published papers, workshops, and a web interface. We look forward to all partners working together to help make these goals a reality.

We are anticipating that the budget for this plan will a significant percent of funds (perhaps 50%) allocated to program coordination and administration. To understand the need for this amount, it is important for all partners to be aware of the scope of what we are envisioning in this plan, and to realize that an effective monitoring program is much more than a lot of seasonal technicians counting birds. It requires personnel to plan monitoring projects; hire, train, and supervise technicians; clean and manage the data; summarize and analyze the data in useful and scientifically appropriate ways; and make the data and analyses available to all through reports, published papers, GIS maps, workshops, and a web interface. Specifically, the following list demonstrates the range of administrative and research tasks that we feel should be accomplished (by the Avian Science Center or other CBM partners) to get the most benefit out of a CBM program:

- plan and implement field surveys sufficient for monitoring of all priority bird species in Montana. This includes (a) hiring technically and physically competent field technicians; (b) revising field manuals and data forms and developing new or enhancing existing teaching/training materials; (c) training field technicians; (d) supervising field crew during the field season; and (e) supervising the entry, cleaning, and transfer of field data for analysis
- provide yearly summaries of tasks performed and birds detected;
- manage data from all participating projects;
- provide access to raw data for all partners;

- summarize and analyze data in useful and scientifically appropriate ways;
- construct and maintain a map-based, interactive interface on the web that is tailored to facilitate access and use by Montana partners;
- provide a quantitative description of the distributions of bird species across the major vegetation types;
- provide syntheses and updates on our current understanding of the status, distribution, and habitat-use patterns of each bird species;
- provide GIS maps of habitat-based distributions based on existing monitoring and habitat relationships data for species that are common enough to generate reliable information;
- provide analyses and implications of habitat-specific data and management effects;
- organize workshops for biologists and managers to explain how to make best use of data from the program;
- provide scientific syntheses of management effects on birds for natural resource planning;
- consult with all partners on continuing needs for support of management decisions;
- produce formal publications related to important results as they become apparent.

ACKNOWLEDGMENTS:

Funding for preparation of this plan was provided in part by grants from the USFS (special thanks to Skip Kowalski), USGS (special thanks to Jon Bart), and Montana FWP (special thanks to Heidi Youmans), and Great Basin Bird Observatory (Elizabeth Ammon).

We thank Skip Kowalski for his support of the USFS Landbird Monitoring Program and Rob Fletcher for his work with the Madison/Missouri River Project.

Comments and discussions have been ongoing with members of the Montana Bird Conservation Partnership and Partners in Flight. Beth Madden and Stephanie Jones also offered specific comments on an earlier version of this plan.

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APPENDIX I. Native bird species regularly breeding in Montana, with survey techniques necessary for adequate monitoring coverage.

	Point counts	Habitat targets	Diurnal Raptors	Wetland area-search	Colony counts	Nocturn. surveys	Species specific surveys
Common Loon				X			X
Pied-billed Grebe				X			
Horned Grebe				X			
Red-necked Grebe				X			
Eared Grebe				X			
Western Grebe				X			
Clark's Grebe				X			
Amer. White Pelican					X		
Double-crest. Cormorant					X		
American Bittern							X
Great Blue Heron		?			X		
Black-cr. Night-Heron					X		
White-faced Ibis					X		
Turkey Vulture	X						
Canada Goose		X		X			
Trumpeter Swan							?
Wood Duck		?		X			
Gadwall		?		X			
American Wigeon		?		X			
Mallard		X		X			
Blue-winged Teal				X			
Cinnamon Teal				X			
Northern Shoveler		?		X			
Northern Pintail		?		X			
Green-winged Teal				X			
Canvasback				X			
Redhead				X			
Ring-necked Duck				X			
Lesser Scaup				X			
Harlequin Duck							X
Bufflehead				X			
Common Goldeneye				X			
Barrow's Goldeneye				X			
Hooded Merganser				X			
Common Merganser		X		X			
Ruddy Duck				X			
Osprey			?	?			
Bald Eagle			X	?			X
Northern Harrier			X	?			
Sharp-shinned Hawk							X
Cooper's Hawk							X
Northern Goshawk							X
Swainson's Hawk	X		X				
Red-tailed Hawk	X		X				
Ferruginous Hawk	?		X				?
Golden Eagle	?		X				
American Kestrel	X		?				
Merlin	X		X				

	Point counts	Habitat targets	Diurnal Raptors	Wetland area-search	Colony counts	Nocturn. surveys	Species specific surveys
Peregrine Falcon			?				X
Prairie Falcon	?		X				?
Ruffed Grouse	X						
Greater Sage-Grouse							X
Spruce Grouse		?					?
Wh.-tailed Ptarmigan							X
Blue Grouse		?					?
Sharp-tailed Grouse		?					?
Virginia Rail							X
Sora							X
American Coot		?		X			
Sandhill Crane		X					
Piping Plover							X
Killdeer	X						
Mountain Plover							X
Black-necked Stilt				X			
American Avocet				X			
Willet		X		X			
Spotted Sandpiper		X		X			
Upland Sandpiper	X						
Long-billed Curlew		?		X			
Marbled Godwit		?		X			
Wilson's Snipe	X						
Wilson's Phalarope				X			
Franklin's Gull					X		
Ring-billed Gull					X		
California Gull					X		
Caspian Tern					X		
Common Tern					X		
Forster's Tern					X		
Least Tern							X
Black Tern				X	X		
Mourning Dove	X						
Black-billed Cuckoo		X					
Yellow-billed Cuckoo							X
Flammulated Owl						X	
Western Screech-Owl						X	
Eastern Screech-Owl						X	
Great Horned Owl						X	
Northern Pygmy-Owl	?					?	
Burrowing Owl							X
Barred Owl						X	
Great Gray Owl						X	
Long-eared Owl						X	
Short-eared Owl							
Boreal Owl						X	
N. Saw-whet Owl						X	
Common Nighthawk	?					?	
Common Poorwill						X	
Black Swift							X
Chimney Swift	X						
Vaux's Swift	X						

	Point counts	Habitat targets	Diurnal Raptors	Wetland area-search	Colony counts	Nocturn. surveys	Species specific surveys
White-throated Swift		X			X		
Bl.-chinned Hummingbird	X						
Calliope Hummingbird	X						
Rufous Hummingbird	X						
Belted Kingfisher		X					
Lewis's Woodpecker		X					
Red-headed Woodpecker		X					
Williamson Sapsucker	X						
Red-naped Sapsucker	X						
Downy Woodpecker	X						
Hairy Woodpecker	X						
Three-toed Woodpecker	X						
Bl.-backed Woodpecker		X					?
Northern Flicker	X						
Pileated Woodpecker	X						
Olive-sided Flycatcher	X						
Western Wood-Pewee		X					
Willow Flycatcher		X		?			
Least Flycatcher		X					
Hammond's Flycatcher	X						
Dusky Flycatcher	X						
Cordilleran Flycatcher		X					
Say's Phoebe	X						
Cassin's Kingbird	X						
Western Kingbird	X						
Eastern Kingbird	X						
Loggerhead Shrike	X						
Plumbeous Vireo	X						
Cassin's Vireo	X						
Warbling Vireo	X						
Red-eyed Vireo		X					
Gray Jay	X						
Steller's Jay	X						
Pinyon Jay	X						
Clark's Nutcracker	X						
Black-billed Magpie	X						
American Crow	X						
Common Raven	X						
Horned Lark	X						
Tree Swallow		X					
Violet-green Swallow		X					
N. Rough-winged Swallow		X					
Bank Swallow		X			?		
Cliff Swallow		X			?		
Barn Swallow	X						
Black-capped Chickadee	X						
Mountain Chickadee	X						
Boreal Chickadee	X						
Chest.-backed Chickadee	X						
Red-breasted Nuthatch	X						
White-breasted Nuthatch	X						
Pygmy Nuthatch		X					

	Point counts	Habitat targets	Diurnal Raptors	Wetland area-search	Colony counts	Nocturn. surveys	Species specific surveys
Brown Creeper		X					
Rock Wren	X						
Canyon Wren	X						
House Wren	X						
Winter Wren	X						
Marsh Wren		X		?			
American Dipper		?					?
Golden-crowned Kinglet	X						
Ruby-crowned Kinglet	X						
Eastern Bluebird	X						
Western Bluebird	X						
Mountain Bluebird	X						
Townsend's Solitaire	X						
Veery		X					
Swainson's Thrush	X						
Hermit Thrush	X						
American Robin	X						
Varied Thrush	X						
Gray Catbird		X					
Sage Thrasher		X					
Brown Thrasher	X						
American Pipit		X					
Sprague's Pipit		X					
Cedar Waxwing	X						
Orange-crowned Warbler	X						
Nashville Warbler		X					
Yellow Warbler		X					
Yellow-rumped Warbler	X						
Townsend's Warbler	X						
American Redstart		X					
Ovenbird		X					
Northern Waterthrush		X		X			
MacGillivray's Warbler	X						
Common Yellowthroat		X		X			
Wilson's Warbler		X					
Yellow-breasted Chat		X					
Western Tanager	X						
Green-tailed Towhee	X						
Spotted Towhee	X						
Chipping Sparrow	X						
Clay-colored Sparrow	X						
Brewer's Sparrow	X						
Field Sparrow	X						
Vesper Sparrow	X						
Lark Sparrow	X						
Lark Bunting	X						
Savannah Sparrow	X						
Baird's Sparrow		X					
Grasshopper Sparrow	X						
Le Conte's Sparrow							X
Fox Sparrow	X						
Song Sparrow	X						

	Point counts	Habitat targets	Diurnal Raptors	Wetland area-search	Colony counts	Nocturn. surveys	Species specific surveys
Lincoln's Sparrow		X		X			
White-crowned Sparrow	X						
Dark-eyed Junco	X						
McCown's Longspur		X					
Chest.-collared Longspur	?	X					
Black-headed Grosbeak		X					
Lazuli Bunting	X						
Bobolink		X					
Red-winged Blackbird	X			X			
Western Meadowlark	X						
Yellow-headed Blackbird		X		X			
Brewer's Blackbird	X						
Common Grackle	X						
Brown-headed Cowbird	X						
Orchard Oriole		X					
Bullock's Oriole		X					
Baltimore Oriole		X					
Gray-crowned Rosy-Finch		X					?
Black Rosy-Finch		X					?
Pine Grosbeak		X					
Cassin's Finch	X						
Red Crossbill	X						
White-winged Crossbill	X						
Pine Siskin	X						
American Goldfinch	X						
Evening Grosbeak	X						
TOTALS	96-102	51-64	8 - 11	41- 46	13 - 15	10 - 12	18 - 28

APPENDIX II. Inventory of existing point count transects in Montana by Quarter Latilong (QLL).
LBMP = Landbird Monitoring Program; BBS = Breeding Bird Survey

QLL	LBMP	BBS	QLL	LBMP	BBS	QLL	LBMP	BBS	QLL	LBMP	BBS
1A	8	.	12D	1	.	24B	.	.	36B	2	1
1B	10	.	13A	2	1	24C	.	.	36C	2	.
1C	2	.	13B	7	1	24D	.	1	36D	2	.
1D	4	1	13C	2	.	25A	4	1	37A	6	.
2A	5	.	13D	4	1	25B	5	1	37B	5	.
2B	5	.	14A	7	.	25D	6	.	37C	3	1
2C	9	.	14B	7	2	26A	6	1	37D	1	.
2D	2	1	14C	5	.	26B	2	.	38A	4	1
3A	.	.	14D	10	1	26C	11	1	38B	1	.
3B	.	1	15A	7	.	26D	2	.	38C	1	.
3C	2	.	15B	2	.	27A	3	1	38D	5	.
3D	2	.	15C	6	1	27B	5	.	39A	3	1
4A	.	.	15D	3	.	27C	2	.	39B	5	.
4B	.	1	16A	4	.	27D	7	.	39C	4	.
4C	1	.	16B	1	.	28A	6	.	39D	.	.
4D	.	.	16C	6	.	28B	7	.	40A	3	.
5A	.	1	16D	2	1	28C	9	1	40B	1	1
5B	1	.	17A	1	.	28D	3	.	40C	2	.
5C	1	.	17B	1	.	29A	8	.	40D	9	.
5D	1	.	17C	1	.	29B	6	.	41A	1	1
6A	1	.	17D	1	1	29C	2	.	41B	1	.
6B	1	.	18A	.	1	29D	4	1	41C	5	.
6C	1	.	18B	1	.	30A	.	.	41D	3	.
6D	.	1	18C	3	.	30B	2	.	42A	1	.
7A	1	.	18D	1	.	30C	.	1	42B	.	.
7B	1	.	19A	1	.	30D	1	.	42C	.	1
7C	1	.	19B	.	1	31A	1	.	42D	.	.
7D	.	1	19C	1	.	31B	.	1	43A	.	.
8A	.	.	19D	1	.	31C	1	.	43B	2	1
8B	1	.	20A	1	.	31D	1	.	43C	5	.
8C	.	1	20B	1	.	32A	1	.	43D	6	.
8D	1	.	20C	.	1	32B	.	1	44A	2	.
9A	1	.	20D	1	.	32C	1	.	44B	1	1
9B	1	.	21A	.	.	32D	1	.	44C	3	.
9C	.	1	21B	.	.	33A	.	.	44D	1	.
9D	1	.	21C	1	.	33B	.	.	45A	2	.
10A	1	.	21D	.	1	33C	.	1	45B	5	.
10B	1	.	22A	.	1	33D	1	.	45C	3	.
10C	1	.	22B	1	.	34A	.	.	45D	1	1
10D	.	1	22C	.	.	34B	.	1	46A	1	1
11A	1	.	22D	.	.	34C	1	.	46B	3	1
11B	1	.	23A	1	1	34D	1	.	47A	2	1
11C	1	1	23B	.	.	35A	.	.	47B	4	.
11D	1	.	23C	.	.	35B	.	.	48B	11	1
12A	1	1	23D	.	.	35C	.	.	49B	1	.
12B	1	.	24A	.	.	35D	2	1			
12C	.	.				36A	7	1			

Appendix III: Dispersed Wetland Sites for Aquatic Bird monitoring

The following wetlands have been selected for bird monitoring. This may not be the final selection list, but it does illustrate the process. It also includes some Discrete sites (eg. Fort Peck Res.) that should probably be dropped from this list.

QLL	BCR	Wetland Site	Pothole	<640 ac	>640 ac	Intermountain
1A	10	Hoskins Lake				x
1A	10	Okago Lake				x
1B	10	Lake Kookanusa			x	
1B	10	Othorp Lake				x
2A	10	Lower Stillwater Lake		x		
2D	10	Boyle Lake				x
3A	10	Slide Lake, GNP				x
3A	10	Lake Sherburne				x
3B	10	Border Lakes at 113012'	x			
3C	10	Hungry Horse Reservoir S. End			x	
4A	11	Sharp Lake on Blackfeet Res		x		
4B	11	Billstad Road Ponds, 34 mi N Cutbank	x			
4B	11	Unnamed pothole end of Red River Rd	x			
5A	11	Ponds, 15 mile coulee 28 mi E of Kevin	x			
5A	11	Pothole + Danielson/Causeway	x			
7A	11	Sprinkle Coulee Reservoir		x		
7B	11	Stock ponds + 232 & Willow Cr. Rd.		x		
7B	11	Pond on Rd 42 NE of Lohman	x			
8A	11	Weygand Reservoir 21 m N of Zurich		x		
8C	11	Threemile Reservoir 20 mi E of Harlem		x		
8D	11	Weigand Reservoir		x		
9A	11	Martin or Horseshoe Lake W of Loring		x		
9A	11	Austin Lake 5 mi S of Whitewater	x			
10C	11	Small res., off Olson Spring Road		x		
10C	11	Ponds @ + Creek Rd & Maxness Rd		x		
10C	11	Stock ponds on Mooner Coulee		x		

11C	11	Todd Lakes		x		
12B	11	Pothole E. of North Star Rd.	x			
12B	11	Flat and Round L. 2 mi N of Westby	x			
14D	10	Mission Reservoir		x		
14D	10	Kicking Horse Reservoir			x	
15B	10	Spotted Bear L.				x
15D	10	Evans Lake				x
15D	10	Jones Lake				x
16A	10	Gibson Reservoir			x	
16C	10	Anderson Lake (W of Augusta)			x	
17A	11	Pond along tracks just east Sun R.	x			
17C	10	Pond at + Knapstad & Leistiko Rd.		x		
18B	17	Harwood Lake			x	
18B	17	Ponds on Mud Spring Coulee		x		
19A	11	Pond, spur rd E of Rd 236 SE of Eagleton	x			
19B	17	Stock Pond NW of Winifred		x		
20B	11	Main L, UL Bend NWR	x			
20D	17	Little Bear Lake near War Horse NWR		x		
21A	11	Lake PR 19	x			
21A	11	Archie Reservoir		x		
21A	11	Buckley Lake		x		
21D	17	Krieder Res.		x		
22A	11	Fort Peck Res.at Fort Peck Proj.			x	
22B	17	Fort Peck Lake at Rock Cr. Access			x	
22B	17	Ponds off NWR 815 Rd		x		
22B	17	Ponds @ + Rock Cr. Rd & Hwy 24		x		
23A	17	2 ponds E of McQuire Cr., e. Dry Arm	x			
24A	17	Fox Lake (WMA)	x			
24A	17	Pond on LoneTree Cr. Off Rd 131	x			
25D	10	Twin Lakes				x
25D	10	High Lake				x
26B	10	Browns Lake				x
26D	10	Stewart Lake				x
26D	10	Fred Burr Lake				x
27A	10	Nevada Lake				x
27D	10	Whitetail Res.			x	
28B	10	Stoyanoff Lake		x		
28B	10	Pond on Whitetail Deer Cr.		x		

29B	10	Lebo Lake		x		
29B	10	Pond on Antelope Creek		x		
29D	17	Pond on Big Elk Creek = 3 mi S. of 2 .	x			
30A	17	Ackley Lake	x			
31B	17	Petrolia Lake		x		
32B	17	Ponds on Hanson Coulee		x		
33A	17	Needle Butte Res.		x		
33A	17	Sunday Creek Reservoir		x		
33A	17	Donley's Reservoir		x		
33C	17	Hay Creek Res.		x		
35A	17	Pond @ Ash Creek,Baldwin Leland Rd.	x			
35B	17	Pond on Mid Fk Cabin Cr N. of Baker	x			
36C	10	Skinner Lake				x
36C	10	Pond off Big Hole R 6 mi. N of Skinner			x	
37B	10	Delmoe Lake				x
37D	10	Ruby River Res.			x	
38A	10	Harrison Lk (Willow Cr. Res.)			x	
38C	10	Axolotl Lakes S. of Virginia City			x	
38C	10	Ennis Lake			x	
39A	10	Fairy Lake				x
39A	10	Mystic Lake			x	
40C	10	Goose Lake				x
40C	10	Huckleberry Lake			x	
41B	17	Rattlesnake Res.		x		
41B	10	Res on Anita Dam Rd SE of Balentine	x			
43C	17	Tongue River Res.			x	
44A	17	Ponds on Little Pumpkin Cr. Rd.		x		
46A	10	Clark Canyon Res.			x	
46B	10	Lima Reservoir			x	
47A	10	Elk Lake				x
47B	10	Upper Red Rock Lake				x
47B	10	Madison arm Hebgen L.				x
47B	10	Coffin Lake				x
48B	10	Nelson Lake				x
48B	10	Painted Rocks L.				x
		Totals by wetland type:	21	34	19	25